Unit 9: Waves
Content Outline: Wave Characteristics (9.1)

I. **Wave**
- A. This is a *disturbance* in matter as energy passes *through it*.
  1. The energy *displaces t*he matter it travels through.
  2. Meaning the matter moves *away from the energy* (up and down; back and forth) but <u>always</u> goes back to its *original position* after the energy has passed.
     a. This up & down movement is what *causes* the "wave" action.

II. There are two types of waves:
- A. **Transverse waves**

  1. These waves are generated as energy moves the matter *up and down* which is *perpendicular to the direction of flow* for the energy, which is *horizontal.*

  Ex: Waves on the surfaces of liquids, waves on strings, electromagnetic waves, and some waves through solids (S type earthquake waves).

  2. Parts of a transverse wave:
     a. **Crest**
        i. This is the position of *maximum positive displacement*. (highest point)
     b. **Trough**
        i. This is the position of *maximum negative displacement*. (lowest point)
     c. **Amplitude**
        i. This is the *total measurement of displacement* from the *equilibrium position* (flat line)
     d. **Wavelength**
        i. This is the total length of one complete wave cycle. (One crest & to another crest.)
- B. **Longitudinal waves**
  1. These waves are generated as energy moves the matter *back and forth (side to side),* which is *parallel* to the direction of flow for the energy, which is *horizontal.*

  Ex: Slinky waves, sound waves, and P type earthquake waves.

  2. Parts of a longitudinal wave:
     a. **Compression**
        i. This is the point of *maximum density* displacement.
     b. **Rarefaction**
        i. This is the point of *minimum density* displacement.
     c. **Amplitude**
        i. This is the *total measurement of displacement* (density of compression).
     d. **Wavelength**
        i. This is one complete wave cycle. (From compression to compression)

III. **Frequency (f)**
- A. This term refers to the number of wavelengths per unit if measured time.
  1. Mathematically expressed as: **f /t** .
     a. f = frequency (number of waves)
     b. T = time (seconds usually)
     c. Units: 1/s or **Hertz or (Hz)**
        They are called Hertz in honor of the German Physicist, Heinrich Hertz (1880).

IV. **Speed (v)**
- A. This term refers to the relationship between a waves' wavelength and its frequency.
- B. Mathematically expressed as: **S = (ʎ)(f)**
  1. ʎ = wavelength (unit of meters)
  2. f = frequency
  3. Units: any unit of distance and time (m/sec.)

V. **Period (T)**
- A. This is the time required for *one complete wave* to pass a specified point.
- B. Mathematically expressed as: T = 1/f
- C. Expressed in seconds.